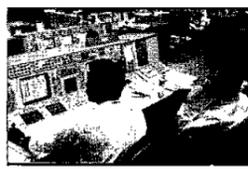


Lesson in large

They're getting ready to break ground for JSC's new Neutral Buoyancy Laboratory, and it will be big. Story on Page 3.



Access change

The days of being able to gain telephone approval of visitor access to Mission Control are gone. Story on Page 4.

Space News Roundup

Vol. 29

August 3, 1990

No. 31



NASA Photo

This view of *Columbia* through the Launch Control Center (LCC) windows at Kennedy Space Center will be repeated soon, but the space shuttle will be traveling in the opposite direction. This photo was taken June 12 as *Columbia* was rolled back to the Vehicle Assembly Bldg. for liquid hydrogen leak-related repairs. *Atlantis*, now on Launch Pad 39A, will be rolled back next week to make room for *Columbia*.

Two shuttles to cross paths on way to pad

By Kyle Herring

Two space shuttles will pass each other on the way to and from the launch pad next week, with *Columbia* heading for space and *Atlantis* heading for repairs.

Columbia was moved from the Orbiter Processing Facility to the Vehicle Assembly Bldg. on Thursday to be mated once again with its external tank in preparation for next month's launch of the STS-35 Astro-1 mission.

The launch was delayed in May after a hydrogen leak was discovered in the disconnect cavity between the orbiter and tank. *Columbia* has been in the OPF undergoing "flight configuration" processing since returning in early June.

With the decision to roll *Atlantis* off Launch Pad 39A to repair a hydrogen leak in the flange seal in the feedline of the external tank, *Columbia* now becomes the next vehicle in line for a mission.

Once *Columbia* reaches the pad, it will be readied for a liquid hydrogen tanking test similar to those conducted on *Atlantis* last month and *Columbia* before that. If no leaks are found in the disconnect area, which was replaced with the new orbiter *Endeavour's* disconnect, *Columbia* could be launched on the 10-day Astro-1 mission during the first week of September.

Hypergolic propellants were not offloaded when *Columbia* was rolled

off the pad in July and the terminal countdown demonstration test with the crew is not scheduled to be repeated.

"It's really an abbreviated pad flow since we already did a lot of the checkouts the first time around," said Mike Conley, JSC vehicle manager.

Atlantis will be rolled to the door of the VAB next week, about a day before *Columbia* rolls out of the VAB to the launch pad vacated by the STS-

38 stack. *Atlantis* will stand by as *Columbia* rolls out the door, and then the returning stack will move into the VAB.

Atlantis will be removed from the stack and returned to the OPF, where it will remain in basically the same configuration before flying its Department of Defense mission in late October or early November.

Columbia's tanking test will be followed by the flight readiness review to determine the actual launch target date.

Discovery, meanwhile, continues processing for the STS-41 Ulysses mission. Launch of the mission can take place only Oct. 5 through 23 due to the required planetary alignment for launch. The next window for the mission is November 1991.

An investigation team reported this past week that movement of an overhead access bridge while connected to *Discovery's* payload bay door was the primary cause for the improper raising of the door in June.

Please see **DISCOVERY**, Page 4



Earlier Hubble fix possible

Replacement camera may be ready in early 1993

A replacement camera to correct the Hubble Space Telescope's optical defects may be ready in the first half of 1993, probably earlier than a manifested mid-1993 shuttle mission, HST Project Scientist Edward Weiler said this week.

Weiler and other NASA officials visited JPL to discuss accelerating development of the new Wide Field/Planetary Camera. The results of the review won't be complete for several weeks.

"Although we scheduled the WFPC-2 to be launched in July 1993, even with the corrections we have to make in some of the optics, we feel that there's a good chance that we'll be able to speed that up to the first half of 1993," Weiler said. "We're obviously motivated to ensure that we do all the important tests to ensure that what we're launching is something that's going to work."

The spherical aberration hindering HST's optical quality mainly affects

the WFPC and the Faint Object Camera, which works in the visible light spectrum. WFPC-2, under development since before the aberration was discovered, will have corrective optics that compensate for the aberration in the same way vision glasses compensate for human vision problems. Engineers are taking extreme care to ensure they develop the correct prescription for the new camera, which should be

Please see **HUBBLE**, Page 4

Eleven complete membership of space advisory committee

Vice President Dan Quayle Thursday revealed the names of 11 individuals who will round out the Advisory Committee on the Future of the U.S. Space Program.

The panel members were selected on the joint recommendation of NASA Administrator Richard Truly and Advisory Committee Chairman Norman R. Augustine, selected last week.

Laurel L. Winkening, provost of the University of Washington at Seattle and a former member of the National Commission on Space will serve as

vice chairman of the group.

Other committee members include Edward C. Aldridge, president of McDonnell Douglas Electronics System Corp. and a former Air Force secretary; Joseph P. Allen, former astronaut and now president of Space Industries International Inc.; D. James Baker, president of Joint Oceanographic Institutions Inc. and a Distinguished Visiting Scientist at Jet Propulsion Laboratory; Edward P. Boland, former Massachusetts Congressman and former chairman of the Sub-Committee on HUD-

Independent Agencies appropriations; and Daniel J. Fink, former chairman of the NASA Advisory Committee and retired vice president for General Electric Co.

Others are Don Fuqua, president of the Aerospace Industries Association of America Inc., former Florida Congressman and former chairman of the House Committee on Science and Technology; Robert T. Horres, retired Air Force general, former vice chairman of the joint chiefs of staff and former commander of the U.S. Space Command; David T.

Kerns, Xerox Corp. chairman and President's Education Policy Advisory Committee member; Louis J. Lanzerotti, distinguished member of the technical staff for AT&T Bell Laboratories, a member of the National Academy of Engineering and chairman of the Space Studies Board of the National Research Council; and Thomas O. Paine, former NASA administrator and chairman of the National Committee on Space.

The committee will advise Truly on overall approaches NASA management can use to implement the space pro-

gram for the coming decades and report its findings within four months.

It will assess alternative approaches and formulate recommendations for civil space goals including such factors as appropriateness of planned activities, organizational balance and structure, adequacy of the workforce skill base, balance between government and private sector roles, possible contributions by other government agencies, the need to maintain a strong research and development capability and assurance of mission success.

Magellan approaches Venus; scientists study lightning

Scientists and engineers are making final preparations for an influx of new data on Venus as the Magellan spacecraft closes on the cloud-enshrouded planet.

Magellan will arrive at Venus next Friday after a trip that started from the Space Shuttle *Atlantis* in May 1989.

The spacecraft is functioning nominally with only one problem with one of the two redundant back-up gyros. When the pair of gyros, B1 and B2, were turned on in preparation for Venus Orbital Insertion, B2 showed evidence of a problem and was turned off. In-flight troubleshooting of the gyro will not be done until after orbital insertion.

The Cruise 26 Command Se-

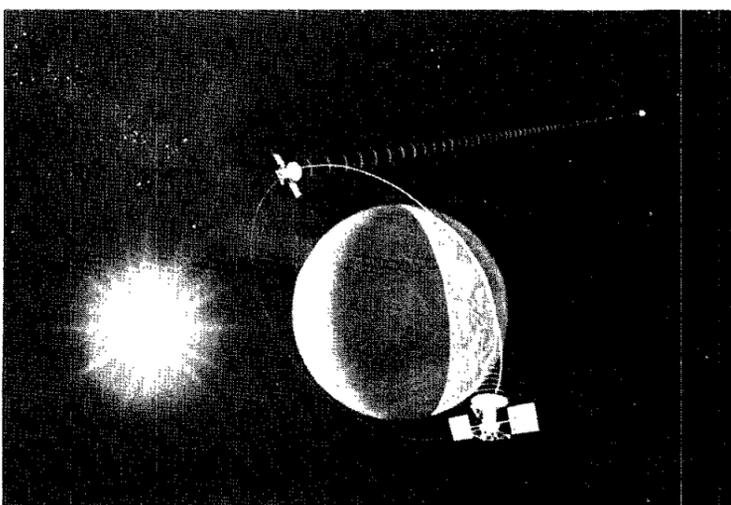
quence, containing the third Trajectory Correction Maneuver, was uplinked on July 23. There was one hit during the uplink and part of the load had to be retransmitted. Several other command loads were transmitted during the week with no difficulty.

Megellan is about 2 million miles from Venus.

While studying the planet, Magellan may supplement information that indicates Venus may have lightning similar to that on Earth.

According to Dr. Christopher Russell, magnetic fields investigator for the Pioneer Venus spacecraft and a geophysics professor at UCLA, previous studies indicated lightning on Venus might be related to volcanic

Please see **PIONEER**, Page 4



NASA Photo

Once Magellan goes into orbit around Venus, it will make detailed topographic measurements of almost the entire planet and perform studies on its geological and atmospheric evolution that may hold clues to Earth's future.

Six employees receive JSC Fellowships

Six JSC employees have been selected to work toward graduate degrees this year, with NASA picking up much of the tab.

Three of the new JSC Fellows will leave the state, but three will remain in the Houston area as they enhance their personal and professional growth. The JSC Fellowship Program will allow the group to attend graduate school for a year on a leave with pay basis.

Shirley Price, JSC's Asian Pacific American Program manager in the Equal Opportunity Programs Office, started attending Texas Southern University in Houston in July. She is pursuing a doctorate in counseling.

Please see **EMPLOYEES**, Page 4

JSC

Ticket Window

General Cinema Theatre (valid for one year): \$3.75 ea.
AMC Theatre (valid until May 1991): \$3.50 ea.
Sea World (San Antonio, year long): adults \$17.25, (2-day, \$21.95); children (3-11) \$14.75, (two-day, \$18.95).

Astroworld (valid 1990 season): season, \$39.95; regular, \$15.97; children, \$9.21; Waterworld, \$8.15; two-day—AW/WW, \$18.47.

Astros vs. St. Louis (1:35 p.m. Aug. 26, Astrodome); last day to buy tickets is Aug. 13: \$6.

End of Summer Fling (Sept. 1-3, South Padre Island): \$199. Breakfast and lunch served two nights at Bahia Mar Resort Hotel. Sunday breakfast buffet, Sunday dinner cruise, Monday lunch buffet at hotel. Dinner snack on return trip.

JSC

Gilruth Center News

Sign Up Policy—All classes and athletic activities are first-come, first-serve. To enroll in any class or activity, you must sign up in person at the Gilruth. Everyone will be required to show their work badge or EAA membership card. Payment must be made in full at the time of registration. No sign ups are taken by phone. Classes tend to fill up four weeks in advance.

EAA badges—Dependents/spouses may apply for a pictured I.D. badge Monday-Friday between 6:30 p.m.-9 p.m.

Defensive driving—Course is offered from 8 a.m.-5 p.m. on Sept. 15 and Oct. 13. Cost is \$15.

Weight safety—Required course for those employees wishing to use the Rec Center weight room. The next classes will be held Aug. 8 and Aug. 23, from 8-9:30 p.m. Cost is \$4.

Ballroom dance—Professional instruction in beginning, intermediate, and advanced ballroom dancing. Classes begin Aug. 2 and meet every Thursday for eight weeks. Beginning and advanced classes meet 7-8:15 p.m. Intermediate class meets 8:15-9:30 p.m. Cost is \$60/couple.

Aerobic and exercise dance—Both classes are on-going.

Mixed volleyball sign-ups—Registration will be held on July 31. This season will consist of a Monday and Friday night league. NASA badged teams will sign up first.

Fall basketball sign-ups—Registration for basketball leagues will be held on Aug. 1-2. This season will consist of Wednesday B, Thursday C, and Tuesday C leagues. NASA badged teams will sign up first.

Country and western dance—Lessons begin Sept. 10. This course will be held every Monday for six weeks, cost is \$20/couple.

JSC

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2. No phone or fax ads accepted.

Property

Sale: Pasadena, 3-2-5-3, den, DR, bkfst. room, game room, study, fans, \$147K, x39509 or 487-4322.

Sale: 1.14 acres, Splendora, TX, wooded, on hill, owner fin. 921-7212.

Sale: Bayglens, 4-2-5-2, cov. patio, stor. shed, cul-de-sac, formals, den, assume FHA 8%, \$140K, x33233 or 480-5061.

Lease: Pipers Meadow, 3-2-2, DR, FPL, gas util., no pets, patio, new carpet, 482-6609.

Sale: Lot on Lake Livingston, 60x115, near lake, util. avail., \$9,500, OBO, x30032 or x31834.

Rent: Lake Livingston w/trfrnt. house, 3-2, CA/H, furn., cov. decks, pier, ex. cond., wknd./wk. rates, 482-1582.

Rent: Lake Travis cabin, priv. boat dock, CA/H, equipped, accomm. 8, \$425/\$325 w/ky., \$85/\$80 dly. 326-5652.

Lease: 3-2-2, near JSC, new paint/carpet, \$595/mo. Oanh, 484-4944.

Sale: Friendswood, 3-2-2 w/Gunite pool, deck, 2K sq. ft., new paint/carpet, fans, \$88,500, x34902 or 996-9128.

Sale: Meadowgreen, 4-2-5-2, 2K sq. ft., formals, patio, deck, 280-8580.

Lease: Piper's Meadow, 2-2-2, no pets, non-smokers, ex. cond., \$750/mo. plus dep. Jan. 488-3524 or 488-3524 x37735.

Rent: Furn. 1 BR studio in home on wtrfrnt., near NASA, pool, flex. lease, \$385/mo. plus dep., discount for gardening serv., util. pd., ref. Mario or Sue, x32799 or 532-1725.

Rent: Bellaire house, 3-1, CA/H, remod., fen., stor., avail. mid Aug., \$625/mo. 488-2664.

Sale: 2 res. lots, 70x185 ea., Friendswood, owner fin. w/10% down. 482-5226.

Sale: Heights 3-2-2, remod., CA/H, FPL, game room, corner, deck, Tom, x31418 or 863-7561.

Sale: Res. lot in estab. executive neighborhood, Friendswood, 996-9157.

Lease: 3-2-2 in LC, MIL floor plan, pre-arranged lawn care, 332-2395.

Rent: 4-2 brick on 1 acre, pond, near JSC, util. incl. in \$1,750/mo. rent. 996-8566 or 240-5542.

Sale: 60 acres on Hwy. 80, 3 mi. from Karnes City, TX, 50 mi. from San Antonio; 2-story house in El Campo, fruit trees on 1.5 lots. 783-9164.

Sale: '81 Broadmore mobile home, 14x80, 80x120 lot w/sidewalks, driveway, stor., \$18,500. 337-1365.

Rent: 2 BR apt., NASA/Ellington, \$415/mo., W/D avail. Dave, x38156 or 486-5181.

Lease: Room in lg. house, furn. avail., \$270/mo., incl. util. Eric, x38420 or 484-9170.

Sale/Lease: 3-2-2, Friendswood, 1,600 sq. ft., formal DR, new paint/carpet, \$64,900 or \$785/mo. Gretchen, 282-6650 or 482-6744.

Lease: 2-1-1, The Landing, refrig., fans, drapes, \$600/mo. plus dep. Gayle, x37708 or 332-7802.

Cars & Trucks

'86 Chrysler LeBaron GTS Turbo, 4-dr., 5-spd., loaded, 62K mi., \$5,500. Laurie, 538-1667.

'88 GMC PU, bedliner, alarm, custom wheels, 18K mi., \$11,200. Roland, 920-7273.

'69 Chevelle, 350, turbo 400, 4.56 gear, 585-4101.

'69 Mustang, good cond., restored, \$4K, OBO, x31670 or 334-3069.

'65 Olds Starfire sport coupe, 106K mi., orig. owner, \$2K, OBO, Tom, x38298 or 488-4089.

'74 Camaro, reb. eng., 350 V8, new tires, alternator, batt., distributor, wtr. pump, good cond., \$650. Lee, x37406 or 532-1576.

'77 Olds Delta 88, 4-dr., all pwr., air, reb. trans., good

cond., \$1K, OBO, x35735 or 488-5105.

'76 Ford Merc. Capri II, auto., V6, manual, AC, 79K mi., hchbk., \$1,200 nego. Paul, x38291 or 488-0550.

'86 Olds Cutlass Supreme Brougham, 2-dr., loaded, ex. cond., \$6K, 283-0237 or 484-9583.

'87 Ford Bronco II, lugg. rack, 5-spd., \$5,900, ex. cond. 486-7276.

'84 Mazda, ex. cond., \$5K. Rick, 283-1988 or 996-8961.

'85 Toyota Supra, loaded, ext. warr., ex. cond., \$7,750. Dale, 283-5356 or 481-0048.

VW Baja bug, sun top, new paint/int., ex. cond., \$1,950, OBO, 488-8952.

'88 Pontiac LeMans, 2-dr., 5-spd., 39K mi., ex. cond., \$4K. Tim, x39926 or 280-9408.

'84 Toyota truck, 5-spd., tint, toolbox, \$3,200. 482-8827.

'64 Chevy PU, worn out, good body, runs, BO. Eveleen, 282-3201 or Carl, 996-8073.

'87 Ford Bronco II, auto., 63K mi., ex. cond., \$7K. 528-2640 or 947-9167.

'80 Toyota Corolla liftback sport coupe, 5-spd., low mi., good cond., \$2,350 or '80 Pontiac Phoenix, liftback, V6, auto., 1 yr. warr., new trans., \$1,950, sell one, not both. x30092 or 481-3637.

'72 MGB, new top, brakes, exhaust, 78K mi., \$3,500. Connie, 482-6651.

'73 Porsche 914, restoration started, does not run, \$575, OBO. 694-8358.

'84 Mustang GL, hchbk., 70K mi., \$2,975. 482-6291.

'89 Volvo 240 DL, 15K mi. Freddie, 333-4760.

'83 Porsche 911 Targa, 36K mi., alarm, 30K mi. left on warr., \$22,500. David, 554-2992 or 282-3212.

'82 Ford F250 Supercab PU, 302 V8, AC, 85K mi., \$4,500, OBO, mark, 335-4213 or 334-1745.

'80 Fiat Spider conv., AC, 57K mi., ex. cond., \$4,200. Mark, 474-2195.

'85 Buick Park Ave., 4-dr., new tires, ex. cond., \$6,400. 482-1535.

'88 Chev. PU, 37K mi., V8, ex. cond., \$7,200. John, x36732 or 474-3308.

'88 Bronco II Eddie Byer, loaded, ex. cond., \$7,175 nego. 332-2229.

'57 Chevy, 2-dr., 210, good cond., 350, 4-spd., ex. cond., \$3,800. x34827 or 482-2320.

Cycles

2 10-spd. bikes, orig. cost, \$190/ea., BO. Patrick, x32635 or 488-1079.

'84 Honda GL 1200A, AM/FM/cass., CB radio, pass. intercom, helmets w/headsets, fairsing, saddle bags, trunk, 35K mi., ex. cond., \$4,100. x39509 or 487-4322.

'82 Harley Davidson XLH, elec. start, ex. cond., low mi., new batt., \$2,875. x30092 or 481-3637.

'66 Schwinn LeTour racing bike, new tires, ex. cond., \$225, OBO. 796-8225.

2 Yamaha 500 motorcycles, parts only, no titles, \$50. Leah Nappier, x38687.

52.5cm Pinarello racing bike, mostly campy parts. George, x37732 or 488-6514.

Boats & Planes

'79 Ventura bass boat, 16' trihull, 115hp merc., trolling motor, good cond., \$2,500. Roland, 920-7273.

'68 fiberglass fishing boat, 15hp Evinrude OB, trlr., trolling motor, \$600. Bob, 482-9576.

'13' Scorpion sailboat, good cond., \$300, OBO. x35735 or 488-5105.

'75 Hustler bass boat, 50hp Evinrude, trlr., trolling motor, \$1,200. x36576 or 332-0704.

'19' Prindle catamaran, race rigged incl. one dacron main, 2 jibs, trlr. w/sail box, \$5K, OBO. Mike T., 333-6246 or 480-5615.

'85 Pursuit center console, 175hp Yamaha OB, Sportsman trlr., offshore fishing, ex. cond., \$16,500. Frank, 333-4073.

'12' fiberglass sailboat, 2 sails, 14' alum. mast, trlr., good cond., \$600. Dave, [409] 925-7822.

Audiovisual & Computers

Sony F-30 8mm camcorder w/video lgt., video bag,

JSC

Dates & Data

Today

OMV Wake—An Orbital Maneuvering Vehicle (OMV) program cancellation party will be at 7 p.m. Aug. 3 at 4407 Peridot. For more information contact Ben, x32381.

Cafeteria menu—Special: tuna and salmon croquette. Entrees: pork chop with yam rosette, Creole baked cod. Soup: seafood gumbo. Vegetables: Brussels sprouts, green beans, buttered corn, whipped potatoes.

Saturday

MAES banquet—The Society of Mexican American Engineers and Scientists (MAES) will hold its annual Scholarship Banquet at 7 p.m. Aug. 4 at the University of Houston Hilton. Contact Lupita Armendariz at x30604 for details.

Monday

Cafeteria menu—Special Italian cutlet. Entrees: braised beef ribs, chicken a la king, enchiladas with chili. Soup: cream of broccoli. Vegetables: navy beans, Brussels sprouts, whipped potatoes.

Tuesday

Cafeteria menu—Special: stuffed cabbage. Entrees: turkey and dressing, round steak with hash browns. Soup: beef and barley. Vegetables: corn cobbette, okra and tomatoes, French beans.

Wednesday

JSC Astronomy Seminar—The seminar will be a Rice University videotape featuring Dr. J. Imbrie, "The Climate Spectrum Over a Range of Periods From 1 Year to 10,000 Years" from noon-1 p.m., Aug. 8, in Bldg. 31, Rm. 129. For more

information call Al Jackson at x31208.

Threshold Group meeting—The Threshold Group will have a meeting from 11:30 a.m.-12:30 p.m. Aug. 8 in Bldg. 45, Rm. 351. For more information, contact James Sturm at x33085.

Cafeteria menu—Special: pepper steak. Entrees: catfish with hush puppies, roast pork with dressing. Soup: seafood gumbo. Vegetables: broccoli, macaroni and cheese, stewed tomatoes.

Thursday

NPMA meeting—The JSC National Property Management Association (NPMA) will meet at 5 p.m. Aug. 9 at the Gilruth Recreation Center. Audrey Schwartz, co-op student in the New Initiatives Programs office at UHCL, will be guest speaker. For more information contact Sandra Pierce at 282-4151.

Cafeteria menu—Special: chicken fried steak. Entrees: beef tacos, barbecue ham steak, Hungarian goulash. Soup: turkey and vegetable. Vegetables: spinach, pinto beans, beets.

Aug. 10

Cafeteria menu—Special: tuna and noodle casserole. Entrees: liver and onions, deviled crabs, roast beef with dressing. Soup: seafood gumbo. Vegetables: whipped potatoes, peas, cauliflower.

Aug. 11

Space Activist Conference—The Houston Space Society will host the fourth Southwest Space Activists' Conference Aug. 11-12 at the University of Houston, Law Center, Teaching Unit 2. Registration is \$10; an effectiveness workshop is \$5. For

further details call 639-4221.

Aug. 15

JSC Astronomy Seminar—The seminar will be a Rice University videotape featuring Dr. J. Wisdom — "Chaos in the Solar System" from noon-1 p.m., in Bldg. 31, Rm. 129. For more information call Al Jackson, x33709.

Aug. 22

JSC Astronomy Seminar—The seminar will be an open discussion meeting from noon-1 p.m. Aug. 22 in Bldg. 31, Rm. 120. For more information contact Al Jackson, x33709.

Aug. 28

BAPCO meeting—The Bay Area PC Organization will meet at 7:30 p.m. Aug. 28 at the League City Bank and Trust. For more information call Earl Rubenstein, x34807, or Tom Kelly, 996-5019.

Aug. 29

JSC Astronomy Seminar—The seminar will be a Rice University videotape featuring Dr. P. Olson — "Geodynamical Consequences of Core-Mantle Interaction" from noon-1 p.m. Aug. 29 in Bldg. 31, Rm. 129. For more information contact Al Jackson at x33709.

Sept. 5

AIAA/NASA Conference—The American Institute of Aeronautics and Astronautics (AIAA) and NASA will sponsor a conference on Innovative Technologies for the Exploration of Space Sept. 5-6, at the Ramada Renaissance Techworld in Washington, D.C. For more information, call Leslie Tavenner at (202) 646-7453.

Swap Shop

\$625. x33233.

MacIntosh SE computer, 1 MEG RAM, 20 MEG HD, SW, 300/1200/2400 baud, BO. Patrick, x32635 or 488-1079.

IBM XT computer, Taxan hi res color, 640K, IBM 30 MG disk, HD & SW, \$1,275. x30092 or 481-3637.

MacIntosh SE/30, 5 MB RAM, 40 MEG HD, Imagewriter II printer, Word 4.0, Hypercard, case, \$3,750. Chuck, 282-6417 or 331-4603.

Stereo w/40 plus watt amp, cass. deck, CD player, turntable, 4 spkrs., \$800. Stacey, x32649 or 480-9793.

Tandy 1000 TL computer, hi res. color monitor, 20 MEG HD, 3 1/2 and 5 1/4 floppies, enh. kybd., deskmate SW. 484-4262.

UVC receiver w/7 band elec. graphic equalizer, 120 WRMS/chan at 0.007% THD, \$250. Bob, 283-1822.

Sony car stereo spkrs., 60 watts, coaxial 2-way, 6x9, \$50. Mark, x30720 or 486-5302.

AT&T 6300, IBM compat., 640K RAM, 30 MB HD, 1 floppy drive, CGA graphics, SW. David, 280-2266 or 332-3072.

Apple II plus, 64K RAM, 2 5.25" floppies, monochrome, color monitors, 300 baud, int. modem, SW, \$500; ADM-3A terminal, 300 baud modem, cables, \$100. Butch, x33506 or 332-3176.

HP 285 program. calculator, calculus derivatives and integration, \$150; Heathkit Zenith H89 computer, full documen., \$500. James, 487-3223 or 623-3782.

Commodore 64/1541 disk drive, joysticks, printer, vicmodem, SW, games, \$450; new computer desk, \$175. Linda, x35352.

Harmon-Kardon Citation pre-amp & FM tuner, new tubes, \$100, OBO, 333-4044.

Microsoft Quick, \$50; Quick Basic, \$50; Macro Assembler, \$80; Word SW, \$100; Lotus 1-2-3 compat. spreadsheet SW, \$50. Martin, x31692 or 488-0949.

XT clone, 640K, 20 MHD, FD, serial/parallel outputs, clock calendar, co-processor, mono monitor, SW, \$700. 282-5301 or 333-2263.

Atari 800 XL kybd. and PS, \$50, OBO, x36886.

Casio FC-1000 graphic Financial Consultant calculator, \$60; Radio Shack electret, dual pattern stereo microphone w/extra cables, \$30. Tom Clark, x39842.

TI99/4A computer w/mem. exp., serial parallel ports, joy sticks, speech synthesizer, \$75; TRS-80 Modem II, \$30; B&K TR110 dual output, var. voltage isolation transformer, \$50. Tom Clark, x39842.

Akai 4 chan. reel to reel, \$100, OBO; Atari 800 computer w/cass. drive, \$100, OBO. Gretchen, 282-6650 or 482-6744.

Musical Instruments

Alpha-1 guitar, dual pickups, amp, reverb, 2 inputs, \$200. Stacey, x32649 or 480-9793.

French horn, Holton mod. H179, dbl. silver horn, ex. cond., 3 mouthpieces, case, \$1,750. Michelle, x38289 or 585-4936.

Magnavox elec. organ, dual kybd./pedals, 12 voices, \$300. George, 280-2307 or 471-0150.

Lost & Found

Lost Christmas week, '89, 1 pearl earring w/3 pearls on silver chains falling from lg. pearl, screw fasteners, reward. Elaine, x31805.

Pets & Livestock

11 yr. old Quarterhorse gelding, 14.5 hands, good beginner horse, veteran trail riding, very stocky built, \$400. Julia, 480-8190 or 331-3304.

AKC reg. Yorkie male. 488-8198.

Free 2 yr. old male English Springer Spaniel (mixed), white w/bk. spots, dog house. Rick, 554-2820 or 554-7796.

Free 1 yr. old fem. Lab/Cocker/Setter outdoor dog, shots, spayed, Ursula, 283-4116 or 996-9415.

2 mo. old male kitten, shots, orange/white, 333-2395.

4 kittens, 2 M, 2 F, wormed, shots, fem. adult cat, long haired, gentle, 338-2377.

Exotic Zebra finches, white w/brn. doves, guinea pigs, \$5/ea. Jim, 282-3750 or 482-6744.

Deep Water

Neutral Buoyancy Laboratory's water will provide earthly means of testing space station assembly

By James Hartsfield

It will weigh more than a billion pounds, have walls of 12-foot thick concrete, an 8-foot-thick bottom, and it will make its inhabitants feel lighter than a feather.

Workers will begin digging a 400,000 cubic-foot hole on the grounds of JSC in December as they start construction of the new Neutral Buoyancy Laboratory (NBL), a facility that may be as crucial to the success of Space Station *Freedom* as the launch pad.

"The only way that we can see that you can prove you can assemble Space Station *Freedom* in orbit," said Vern Hammersley, chief of the Man-Systems Division's Facilities Operations Branch, "is to do it in the water first."

Simulating weightlessness on Earth in enough quantity to practice assembling *Freedom*, or even a few parts of *Freedom*, means thinking big. And the NBL is a lesson in large, said Bill Roeh, the facility's project manager from the Facility Development Division.

The Pool will be 60 feet deep, 135 feet wide and 235 feet long. The building that will surround it could hold a football field sans one end zone, and its ceiling will reach almost as high as nine-story Bldg. 1, with a 10-ton crane that can traverse its length.

"The size has been the challenge," Roeh said. "Our design team has really enjoyed working on all the unusual aspects of it. It's been a set of new frontiers and has expanded their engineering skills."

The NBL is the first building at JSC designed specifically as a neutral buoyancy facility. All past such pools, including the current Weightless Environment Training Facility (WETF), have been housed in hand-me-down buildings modified to accept them.

First, there was the Water Immersion Facility (WIF) installed in Bldg. 5 in 1966. Next, the

WIF was moved to Bldg. 260, occupying a tank previously used to practice splash-downs and recoveries at sea. Then, in 1980, the WETF was born in Bldg. 29, a building that previously had held a centrifuge.

The NBL will be completed in June 1993. And it will be a first-of-a-kind.

Due to its 60-foot depth, astronauts will have to decompress following a training session. They will enter the pool from the surface to begin training, but they will leave through an underwater

door in the side of the pool, 30 feet down. The door will lead to a more than three stories tall, 26-foot diameter, solid stainless steel exit chamber, half-filled with water and half-filled with a compressed atmosphere.

Astronauts will exit the water there, doff their suits and then move through a common air lock to either of two decompression chambers, both capable of being used as medical facilities or as decompression and debriefing areas.

The decompression chambers are designed to take subjects to a pressure equal to 160 feet underwater, a requirement for treatment of decompression sickness, commonly called "the bends."

"The exit chamber permits us to decompress suited crewmen in their shirt sleeves,"

Hammersley said. "Without it, they would have to make long decompression stops at certain depths on the way up."

Scuba divers won't have to decompress; they will be rotated once an hour. And they'll breathe nitrox, a compressed air mixture of about 40 percent oxygen, 60 percent nitrogen, instead of the standard 20 percent oxygen, 80 percent nitrogen compressed air in scuba tanks. The oxygen-rich nitrox will provide an additional safeguard against decompression sickness that can be caused by frequent deep dives.

The pool will be heated to 84 degrees, the optimum temperature for diving safely. Each of the 14 million gallons of water it holds will be filtered once every 24 hours, at a rate of 10,000 gallons per minute through filters that remove particles smaller than human red blood cells. A slower, 1,000 gallon-per-minute bank of filters will continually "polish" the water, removing particles as small as those that make up smoke.

To build the NBL, 33 wells will be drilled 85 feet deep around the perimeter of the building site, draining the water table to a depth of 40 feet at the location. The pool will be built 30 feet below ground, 30 feet above ground.

Due to the weight of water as the pool is

filled, its sides and bottom are designed to flex as the structure settles. The pool may settle as much as 2 inches. The sides may bow outward as much as a half foot each.

The pool is designed to flex, but the building surrounding it is not. So special connections and expansion joints have been designed in attachments between the two to allow for the pool's movement. Also, two viewing windows will be in the side of the pool, 15 feet underwater.

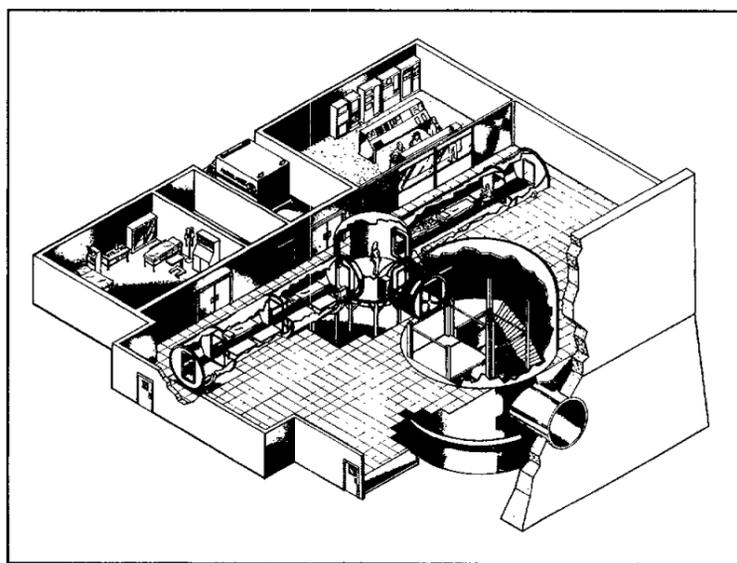
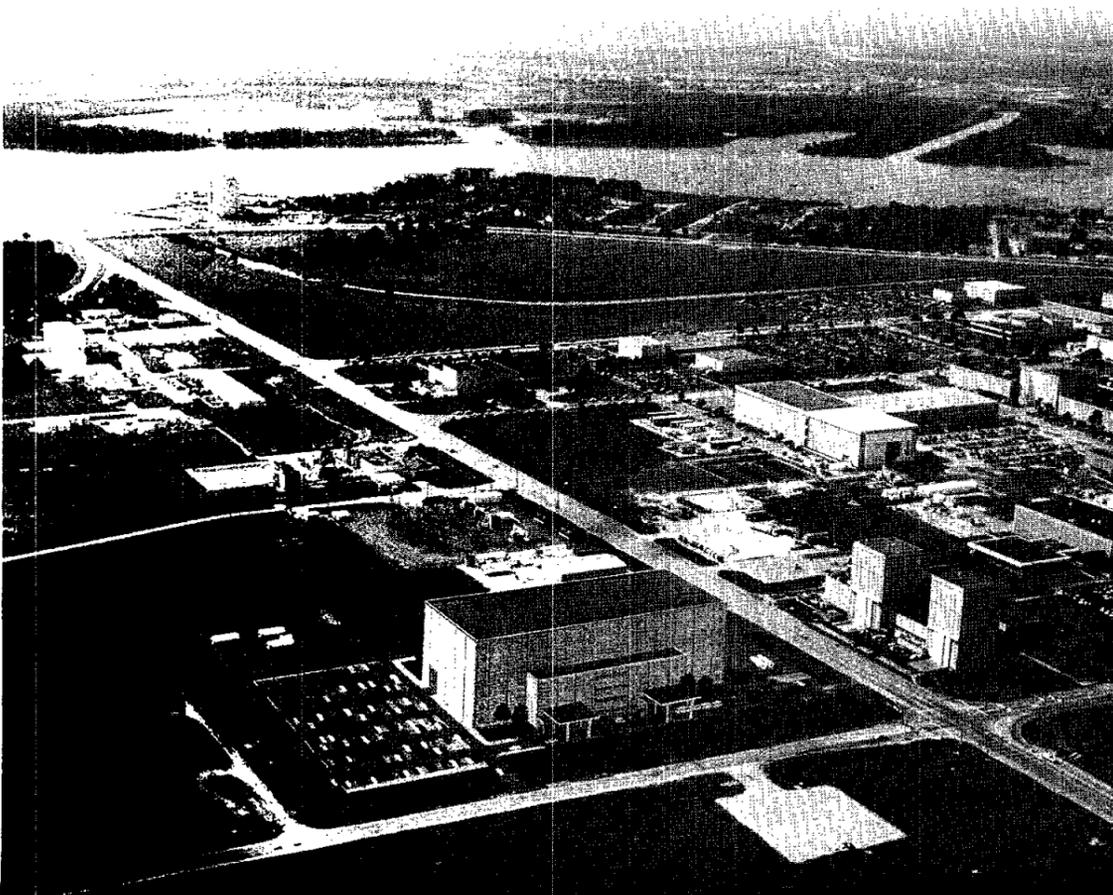
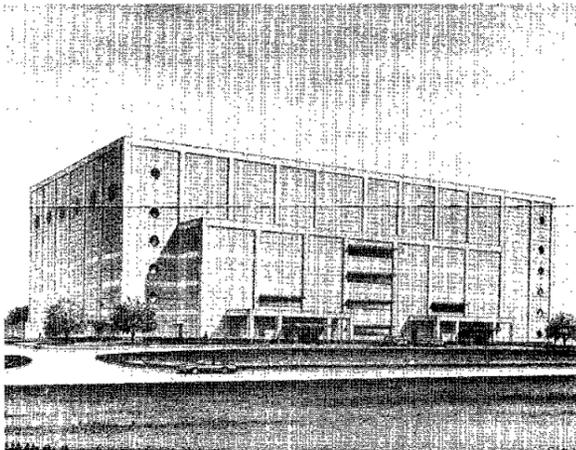
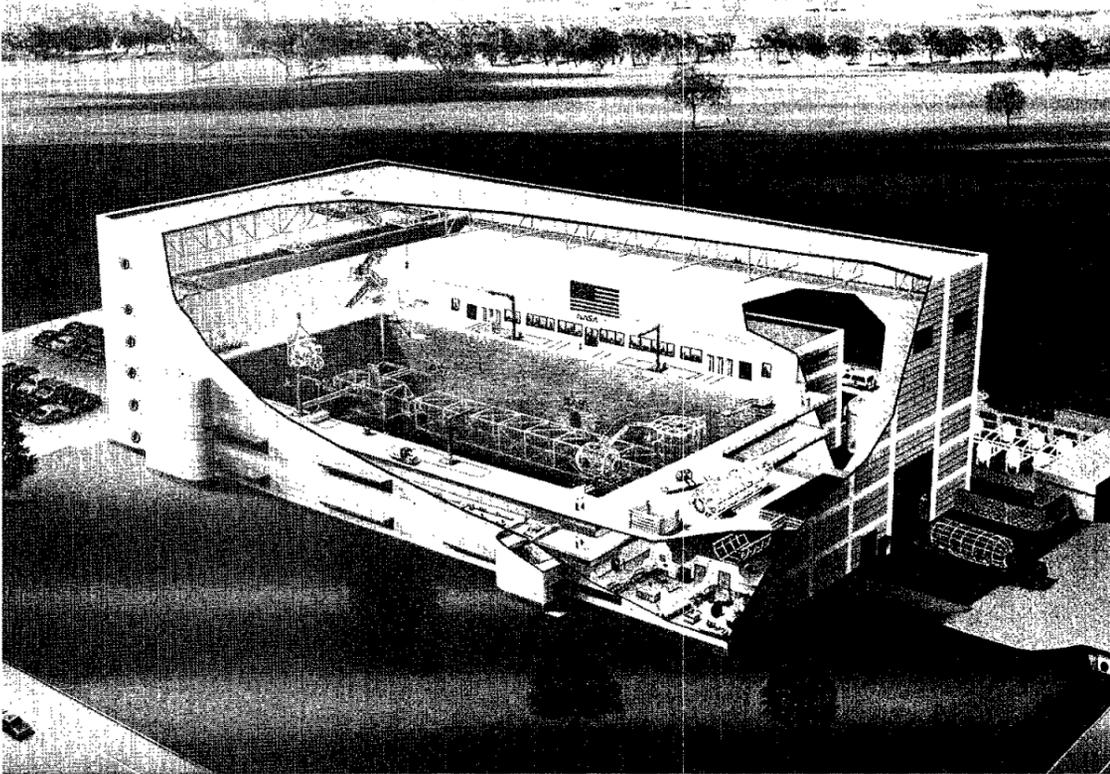
An aircraft carrier-type cutaway in the deck of the pool will allow mockups to be hoisted from a storage area below the floor to the deck. Four small cranes will be located along the edges of the pool to lower astronauts or objects into the water.

The NBL is designed to allow multiple training activities to be done at once. For example, a shuttle crew and a *Freedom* crew can train underwater at different spots in the pool simultaneously.

A 32,000-square-foot wing on the building will house offices, mechanical equipment, changing areas and technical support areas. A future wing on the opposite side of the building is designed to accommodate a balcony viewing area 15 feet above the pool's deck.

The NBL will be built at the corner of Avenue B and 2nd Street, and is projected to cost from \$30 million to \$40 million. An invitation for bids on the project is scheduled for September, Roeh said. A contract will be awarded in December with groundbreaking following soon after. After the NBL is finished and operational, the WETF will remain in a standby mode for one year. After that, its future is uncertain.

"The most exciting time for me will be when they're pouring the concrete for the pool bottom and walls," Roeh said. "And it will also be the most critical."



Illustrations by Johnson Engineering

Top: A cutaway drawing of the planned Neutral Buoyancy Laboratory shows the 60-foot-deep pool will be half above and half below ground inside a massive building. Center: An artist's concept of how the building will look from the outside. Above: Another cutaway shows the decompression area. Astronauts will leave the pool through the tunnel at bottom right, pass through the half-filled exit chamber, shed their space suits and enter the decompression and debriefing area. Left: The new facility, almost as tall as Bldg. 1, will be just south of the Gilruth Recreation Center and JSC Child Care Center.

Two science fair winners find summer employment at JSC

By Pam Alloway

Two area high school graduates are getting a taste of the aerospace industry at JSC this summer after having won awards at the Regional Science and Engineering Fair in Houston this spring.

JSC's Space and Life Sciences Directorate provided a panel of judges comprised of one representative from each of its divisions to conduct a separate judging of the science fair entries. Winners of the

separate judging received employment for eight weeks at JSC and the opportunity to work on a hands-on project, said Dr. Howard Schneider, the directorate's mission scientist. Schneider worked with Dr. Carolyn Huntoon, Space and Life Sciences director, in organizing the awards for the first time this year.

This year's winners are Oudam Em and Mark Woodings, both of Houston.

Em, 18, a graduate of Scarborough

High School in northwest Houston, is working in the microbiology laboratory in Space and Life Sciences' Biomedical Laboratories Branch, studying levels of airborne microorganisms in various buildings on site. He is working under the guidance of the branch's deputy chief Dr. Duane Pierson.

Em plans to major in physics at Rice University this fall. His eventual goal is to earn a doctorate degree in physics and work in some aspect

of research, he said. The experience at JSC this summer already is proving itself valuable, he said.

"It gives you a very good overview into the research world," Em said.

Em's science fair project was a botany experiment in which he looked at the effects different magnitudes of gravity had on plant growth.

Woodings, 17, a graduate of McCullough High School of The Woodlands, will major in engineering

when he begins his studies at Texas A&M this fall.

Woodings' summer project concerns certain portions of the Automated Test and Checkout System, a system on which a substantial amount of testing is done on life sciences medical experiments.

"I've learned quite a bit about electronics," Woodings said of his job experience at JSC thus far.

Woodings science fair entry involved magnetic levitation.

Mission Control access can't be granted by phone

Policy changes for temporary access to the Mission Control Center's second floor have eliminated telephone approval.

Previously, those individuals needing access to the MCC second floor for official business for no more than 30 days could obtain approval by telephone. Under the new policy, anyone visiting the area will be required to have a completed JSC Form 722 PCZ and MCC Second Floor Card Request signed by a designated approving official.

JSC employees with access to the second floor for official business may request permission to escort unofficial visitors to the area, except during mission status which begins 10 days prior to launch and continues through landing.

In groups of one to six people, each visitor must fill out a JSC Form 722, in addition to the request for site badging.

For groups of more than six people, employees should contact the JSC Security Division at x34441 to make the necessary arrangements.

STS-35, STS-38 car passes gone

Car passes for STS-38 and STS-35 are no longer available to JSC employees and their families who wish to view launch or landing.

Passes are available for future missions on a first-come, first-served basis.

Requests should be submitted in writing to the Public Affairs Office's Public Services Branch, Code AP4. Be sure to include name, mail code or alternate address, type of vehicle, telephone extension, mission and whether a launch or landing pass is being sought.

White sands trio receives accolades

Three aerospace engineers at JSC's White Sands Test Facility recently were honored for their work on the Fifth International Symposium on Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres.

Joel Stoltzfus, Frank Benz and Jack Stradling are the first recipients of the American Society for Testing and Materials' award for excellence in symposium and publication management.

The award recognizes the engineers for an "outstanding job in organizing a successful symposium" and for publishing "Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres, 4th Volume" quickly and efficiently.

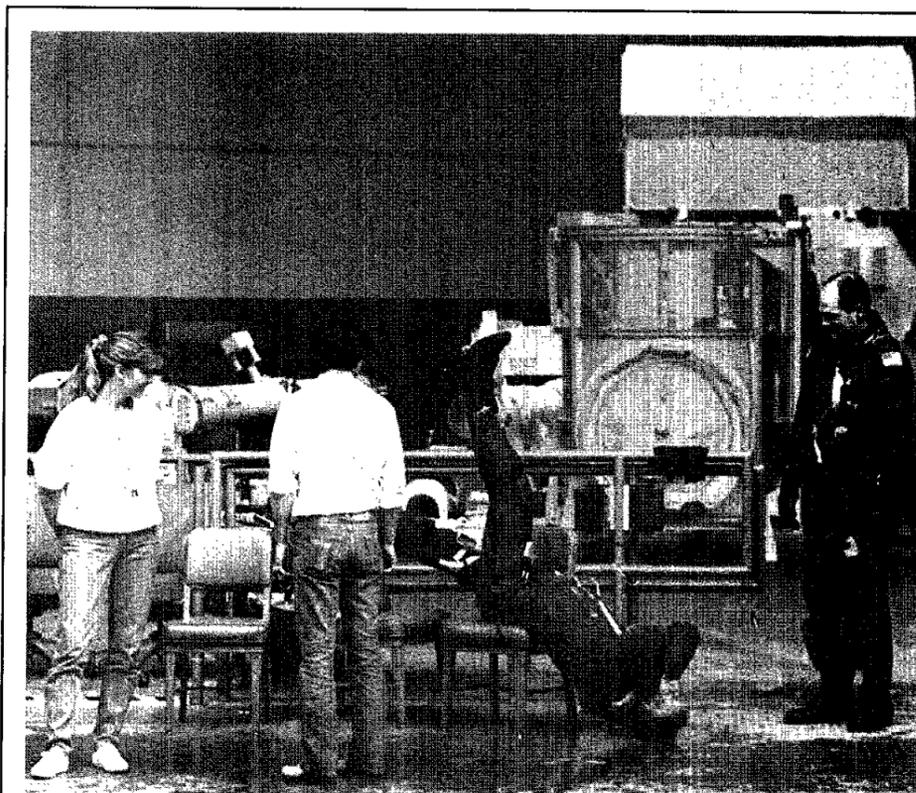
Stoltzfus, Benz and Stradling selected 24 articles for publication from the 31 submitted during the April 1989 symposium held in Las Cruces, N.M.

Discovery mishap report

(Continued from Page 1)

Contributing causes included failure to follow the approved procedure, deficient work control systems to preclude bridge movement while connected to a payload bay door and deficient work scheduling.

The board, chaired by Paul Myers, technical assistant to KSC's director of Engineering Development, was not charged with determining any damage to the payload bay door, but thorough inspections showed none.



UPSIDE DOWN DELUGE—Training for space flights can be a topsy-turvy experience at times, as STS-35 Mission Specialist Jeff Hoffman discovered recently. After participating in emergency egress training in the Weightless Environment Training Facility pool, Hoffman needed a gravity assist to get water out of his suit. Watching were, from left, trainers Betsy Youmans and Ken Trujillo, and STS-35 Pilot Guy Gardner.

Employees earn awards for their contributions

JSC Director Aaron Cohen presented 19 JSC employees with awards for inventions and contributions, productivity improvement, patents and Tech Briefs during a Productivity Improvement and Space Act Awards ceremony Monday.

Recipients of Inventions and Contributions Awards were: Walter W. Guy, Thomas M. Grubbs, Ralph J. Marak, Alden C. Mackey, Robert C. Ried, Leslie St. Leger, Maxime Faget and Eugene Wendler for their work on "Shuttle Launch Overpressure Barrier;" Frederick S. Dawn and Joseph J. Kosmo for "Polycarbonate Article with Chemical Resistant Coating;" Dennis Wells for "Nozzle Fabrication Technique;" and Brian G. Morris for "Methods and Apparatus for Providing Real-Time Control of a Gaseous Propellant Propulsion System."

James M. Janney was honored with the Productivity Improvement award for "Deletion of Orbiter Vent Doors 4 and 7."

Recipients of the Tech Brief awards were Sharon P. Goza for "Solid Surface Modeler (SSM);" Royce G. Forman for "Fatigue Crack Growth Computer Program NASA/FDLGRO;" Timothy F. Cleghorn for "Interactive FORTRAN Programs for Microcomputers to Calculate the Thermal Physical Properties of Twelve Fluids;" and Clarence Sams and David A. Wolf for "High Aspect Cultural Vessel." Wolf also was recognized for "Three-Dimensional Coculture Process" and "Biologically Active Factors Produced by Multicellular Cocultivation."

Gerald R. Taylor received the Patent Award for "Portable/Bedside Retinal Digital Image Analysis System."

Pioneer data reveals lightning in Venus cloud layers

(Continued from Page 1)

activity on the surface of the planet.

But in a research report being published this summer, new studies indicate the Venus lightning occurs in the afternoon, just as on Earth, and probably is related to cloud activity not volcanic activity on the surface.

Russell said an analysis of radio signal data shows there appears to be as much or even more lightning within the thick, high cloud layers of

the cloud-shrouded planet as there is on Earth. The physical properties of the solid and liquid particles in the Venusian clouds, as well as temperatures and atmospheric pressure, also appear similar to those in Earth clouds, he said.

Most of the radio signal data Russell analyzed was obtained during the Pioneer orbiter spacecraft's 4,000 orbits of Venus from 1979 to 1990.

Other scientists working on the

Venus data are Dr. Robert Strange-way, UCLA; and William Borucki and John Dyer, both of NASA's Ames Research Center, Mountain View, Calif., which manages the spacecraft for NASA's Office of Space Science and Applications.

Some disagree with Russell's findings and believe it is possible that Pioneer measured local disturbances in Venus' ionosphere instead of lightning.

"The predominance of the data," Strangeway said, "suggests that what we're seeing on the planet is lightning, though there are events which may not be lightning," he added.

Studies of lightning on Earth also have been made using radio data like that received by Pioneer. Lightning flashes on Earth produce radio waves that circle our planet. Lightning has been reported on planets Earth, Jupiter, Saturn and Uranus.

Hubble ultraviolet images coming out beautifully

(Continued from Page 1)

available at the end of August.

"Right now it looks like we will be taking a little longer to develop the prescription of the mirror," Weiler said. "It's extremely important that when the WFPC-2 team starts building their corrective optics that they have the right prescription."

Meanwhile, Weiler said, many of the early problems with tracking

guide stars and operating the telescope are being worked out. "We're starting to really operate the spacecraft in an efficient manner."

Five pictures taken last week by the Faint Object Camera in ultraviolet light proved Hubble's primary mirror is remarkably free of any contamination.

"These images came out beautifully," he said.

This week, HST scientists prepared to check out HST's High-Resolution Spectrograph, which will divide light into its component parts and investigate the chemical and physical processes at work in stars and galaxies.

The spectrograph was aimed at stars in a giant nebula called 20 Doradus, or the "Tarantula Nebula" in the Large Magellanic Cloud, as

part of the checkout.

"They have been sailing through all their tests and have accumulated no anomalies against them," mission operations director Joe Ryan said of the Goddard High Resolution Spectrograph team. "They're ready to go. That's one of the instruments we're going to be relying on heavily" until WFPC-2 is launched.

Employees receive fellowships to continue graduate studies

(Continued from Page 1)

Sean Kelly, a Shuttle Mission Simulator training instructor for the Mission Operations Directorate will begin work toward a masters in biomedical engineering at Harvard University in September.

Jodi Seaborn, systems analyst and knowledge-based systems specialist in the Engineering Directorate's Intelligent Systems Branch, will work on a masters in machine vision at the University of Wisconsin at Madison.

Horacio de la Fuente of Engineering's Structures and Mechanics Division is attending the University of Colorado at Boulder studying for his doctorate in aerospace engineering.

Glenda Johnson, a program analyst in the Space Station Projects Office, will work on her administration

doctorate at the University of Houston beginning in September.

Duane Emmons, chief of the Administrative Services Branch in the Center Operations Directorate, will pursue his doctorate in public administration at the University of Houston starting in September.

JSC Fellowship applications are judged by the degree to which the desired education will benefit both NASA and the candidate, coupled with the candidate's need. Approved by JSC Director Aaron Cohen and a selection committee of five senior managers, the six 1990 fellowship recipients continue the trend of large groups in recent years.

The Fellows have agreed to return to JSC for at least three times the length of their training period.

Space News Roundup

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Swap Shop submission deadline is every Friday, two weeks before the desired date of publication.

Editor Kelly Humphries
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Kari Fluegel

Phone switch set for August

Telephone users at Ellington Field will have another month before their 483-prefixed numbers are changed to a 244 prefix, a move necessitated by JSC's need for phone system expansion.

The switching of the Ellington numbers was delayed to Aug. 25-26 because of the amount of activity generated by the recent relocation of a number of JSC employees. The transition also was not time-critical.

The new numbers will be effective Aug. 27.

A total of 5,000 numbers ranging from 244-5000 to 244-9999 will be brought on line, as needed, to cover JSC and Ellington telephone needs.

Once the switch is made, local JSC or Ellington callers will dial 4-plus the last four digits, while the Federal Telephone System prefix will be 521.